

ANNEX
BETWEEN
THE NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
GLENN RESEARCH CENTER
AND RADIAN AEROSPACE INCORPORATED
UNDER SPACE ACT UMBRELLA AGREEMENT
NO. SAA3-1726, DATED _____ (ANNEX NUMBER 01).

ARTICLE 1. PURPOSE

This Annex shall be for the purpose of providing Radian Aerospace Inc. (Radian) with the capabilities and characteristics of the various NASA GRC-Derived polymer aerogel composites available. NASA GRC will assist in material evaluation in regard to the placement of the aerogel within a Radian-developed vehicle structure for optimal thermal insulation. NASA GRC will perform a baseline characterization and feasibility study to determine optimal formulations.

ARTICLE 2. RESPONSIBILITIES

A. NASA will use reasonable efforts to:

1. Provide Aerogel Baseline Characterization. NASA GRC will use reasonable efforts to evaluate and perform a baseline characterization of the various aerogel materials that are available and suitable for aerospace applications requiring extreme temperature mitigation. This analysis will include poresize/surface area analysis, thermal analysis, mechanical analysis, and energy absorption/impact analysis.
2. Perform an Optimization Study and down-select of polymer aerogels. Selection of primary polymer aerogel to be used as potential tank solution.
3. Fabricate Optimal formulations based on superior thermal properties. Optimal formulations fabricated according to specifications determined by the Partner.
4. Assess the optimal location of the polymer aerogel within the tank structure. Investigate optimal placement of aerogel within the structure to provide the best insulating capability between the Liquid Oxygen (LOX) and the Tank Thermal Protection System (TPS). Such placement shall consider at least the following options: Internal to LOX tank, Within the tank structure, and external to LOX tank.
5. Provide a final report to Radian.

B. Radian will use reasonable efforts to:

1. Provide defined target environment and expected materials properties. Temperature, pressure, and any relevant data integral to optimization of material fabrication.

2. Provide honeycomb structure and tank parts to NASA GRC for aerogel material placement study.

ARTICLE 3. SCHEDULE AND MILESTONES

The planned major milestones for the activities defined in the "Responsibilities" Article are identified below. The current circumstances related to the COVID-19 pandemic may significantly impact the schedule and milestones of this Annex and dates are therefore subject to a considerable degree of variability. The Parties may utilize a separate document labeled as "Appendix A: Schedule Coordination Matrix" ("Appendix A") to coordinate possible changes to the Annex schedule. The Appendix is utilized only for Annex performance planning purposes and the terms and conditions of this Agreement control. Any change to schedule identified in the Appendix must be signed or approved by the applicable Management Points of Contact or Technical Points of Contact for the respective Parties, as appropriate. The dates included in the aforementioned Appendix are the best approximation at the time this Annex was created and may be amended. Prior to work start, Radian will provide NASA GRC with target properties for polymer aerogel as well as initially planned tank structure material

1. Radian will provide NASA GRC with target properties for polymer aerogel as well as initially planned tank structure material. SEE APPENDIX A.
2. NASA GRC provide Aerogel Baseline Characterization. SEE APPENDIX A.
3. NASA GRC perform an optimization study and down-select of polymer aerogels. SEE APPENDIX A.
4. NASA GRC assess the optimal location of the polymer aerogel within the tank structure. SEE APPENDIX A.
5. NASA GRC fabricate Radian defined optimal aerogel. SEE APPENDIX A.
6. NASA GRC provide final report to Radian. SEE APPENDIX A.

ARTICLE 4. FINANCIAL OBLIGATIONS

A. Partner agrees to reimburse NASA an estimated total cost of \$177,737.00 for NASA to carry out its responsibilities under this Annex.

Partner agrees to pay NASA GRC a first installment of \$55,737.00 prior to initiation of work under this Agreement, a second installment of \$65,000.00 prior to the start of Milestone No. 3., and a final installment of \$57,000 prior to the start of Milestone No. 5.

Each payment shall be marked with [GRC SAA3-1726 and Annex No. 01].

B. NASA will not provide services or incur costs beyond the current funding. Although NASA has made a good faith effort to accurately estimate its costs, it is understood that NASA provides no assurance that the proposed effort under this Annex will be accomplished for the estimated amount. Should the effort cost more than the estimate, Partner will be advised by NASA as soon as possible. Partner shall pay all costs incurred and have the option of canceling the remaining effort, or providing additional funding in order to continue the proposed effort under the revised estimate. Should this Annex be terminated, or the effort completed at a cost less than the agreed-to estimated cost, NASA shall account for any unspent funds within 180 calendar days after completion of all effort under this Annex, and promptly thereafter, at Partner's option return any unspent funds to Partner or apply any such unspent funds to other activities under the Umbrella Agreement. Return of unspent funds will be processed via Electronic Funds Transfer (EFT) in accordance with 31 C.F.R. Part 208 and, upon request by NASA, Partner agrees to complete the Automated Clearing House (ACH) Vendor/Miscellaneous Payment Enrollment Form (SF 3881).

ARTICLE 5. INTELLECTUAL PROPERTY RIGHTS - DATA RIGHTS

A. Data produced under this Annex which is subject to paragraph C. of the Intellectual Property Rights - Data Rights Article of the Umbrella Agreement will be protected for the period of one (1) year.

B. Under paragraph H. of the Intellectual Property Rights - Data Rights Article of the Umbrella Agreement, Disclosing Party provides the following Data to Receiving Party. The lists below may not be comprehensive, are subject to change, and do not supersede any restrictive notice on the Data provided.

1. Background Data:

The Disclosing Party's Background Data, if any, will be identified in a separate technical document.

2. Third Party Proprietary Data:

The Disclosing Party's Third Party Proprietary Data, if any, will be identified in a separate technical document.

3. Controlled Government Data:

The Disclosing Party's Controlled Government Data, if any, will be identified in a separate technical document.

4. The following software and related Data will be provided to Partner under a separate Software Usage Agreement: NONE.

ARTICLE 6. TERM OF ANNEX

This Annex becomes effective upon the date of the last signature below ("Effective Date") and shall remain in effect until the completion of all obligations of both Parties hereto, or one (1) year from the Effective Date, whichever comes first, unless such term exceeds the duration of the Umbrella Agreement. The term of this Annex shall not exceed the term of the Umbrella Agreement. The Annex automatically expires upon the expiration of the Umbrella Agreement.

ARTICLE 7. RIGHT TO TERMINATE

Either Party may unilaterally terminate this Annex by providing thirty (30) calendar days written notice to the other Party.

ARTICLE 8. POINTS OF CONTACT

The following personnel are designated as the Points of Contact between the Parties in the performance of this Annex.

Management Points of Contact

NASA

Timothy D Smith
Supervisory Aerospace Engineer
Mail Stop: 162-7
21000 Brookpark Road
Cleveland, OH 44135
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Radian Aerospace Incorporated

Livingston Holder
Chief Technology Officer
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livingston@radianaerospace.com

Principal Investigator Point of Contact

NASA

Stephanie L. Vivod
Research Chemical Engineer
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Stephanie.L.Vivod@nasa.gov

Radian Aerospace Incorporated

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esther.deena@radianaerospace.com

ARTICLE 9. MODIFICATIONS

Any modification to this Annex shall be executed, in writing, and signed by an authorized representative of NASA and the Partner. Modification of an Annex does not modify the terms of the Umbrella Agreement.

ARTICLE 10. SIGNATORY AUTHORITY

The signatories to this Annex covenant and warrant that they have authority to execute this Annex. By signing below, the undersigned agrees to the above terms and conditions.

NATIONAL AERONAUTICS AND
SPACE ADMINISTRATION
GLENN RESEARCH CENTER

RADIAN AEROSPACE INC.

BY: _____
James A. Kenyon, Ph.D.
Acting Center Director

BY:  _____
Curtis Gifford
COO Radian Aerospace

DATE: _____

DATE: 7/27/2022